SISTO®






Diaphragm Valves with Handwheel and/or Pneumatic Actuators

SISTO®-KB
SISTO®-10
SISTO®-16 RGA
SISTO®-16 HWA / DLU / TWA
SISTO®-16 / 16-S
SISTO®-20
SISTO®-LC
SISTO®-B
SISTO®-C

Check Valves

KRV
RSK / RSK-S

Pneumatic actuators

PISTON ACTUATED LAP
DIAPHRAGM ACTUATED LAD

TÜV CERT DIN ISO 9001
TÜV CERT DGR 97/23/EG
CE
KSB

1. EC declaration of conformity

Date: 1st June 2003

Herewith we,

SISTO Armaturen S.A.
Zone Industrielle
6468 ECHTERNACH
Luxemburg

declare that the valves listed below satisfy the fundamental safety requirements laid down in the Pressure Equipment Directive 97/23/EC (PED), annex 1.

Description of valve types:

Diaphragm Valves with Handwheel and/or Pneumatic Actuators		
SISTO®-KB	PN 10	DN 015 - 200
SISTO®-10/10 M	PN 10	DN 015 - 300
	PN 10	Rp 1/2“ - 3“
SISTO®-16 RGA	PN 16	DN 015 - 050
	PN 16	Rp 1/2“ - 3“
SISTO®-16 HWA / DLU / TWA	PN 16	DN 015 - 200
SISTO®-16 / 16-S	PN 16	DN 015 - 200
SISTO®-20	PN 16	DN 015 - 200
SISTO®-LC	PN 10	DN 015 - 050
SISTO®-B	PN 10	DN 015 - 050
SISTO®-C	PN 16	DN 006 - 150
Check Valves		
KRV	PN 10	DN 020 - 200
RSK / RSK-S	PN 16	DN 025 - 200
	PN 10	DN 250 - 300

And other standards / codes: **DIN 3356, AD Merkblatt A4**

Suitable for **Fluid groups 1 and 2**

Conformity assessment procedure: **Module A1**

Name and address of the notified body responsible for approval and surveillance:

TÜV Anlagentechnik GmbH
Unternehmensgruppe Rheinland / Berlin-Brandenburg
Am Grauen Stein
51105 Köln
Germany

Identification number of the notified body: **0035**

Certificate number: **PED-01202711-Ü-010001**

The valves DN ≤ 25 correspond to the Pressure Equipment Directive 97/23/EC, Art. 3 § 3. Therefore, they are not to be identified by a CE-symbol or with a number by a designate agency.

Rolf Rühl
Quality Management

(This document has been prepared electronically and is valid without signature.)

2. General instructions

These operating instructions apply to all diaphragm valves, pneumatic actuators and check valves of SISTO Armaturen S.A. as described in section 5, unless reference is made to other operating manuals in individual cases.

Only correct installation, maintenance or repair will ensure smooth operation of the valves and pneumatic actuators.

The manufacturer shall not accept any liability if the instructions set forth in this manual are not complied with.

The design, manufacture and testing of SISTO Armaturen S.A. valves are subject to a QM system to DIN EN ISO 9001 as well as the European Pressure Equipment Directive 97/23/EC. Compliance with these requirements, however, is based on normal, static loading, e.g.

- fluids without particularly corrosive, chemical or abrasive effects
- flow velocities typical of the fluid handled
- typical temperature gradients
- without additional influences such as piping forces, vibrations, wind load, earthquakes, corrosive environment, fire, traffic load, decomposition pressure of unstable fluids, etc.

Other than normal operating conditions must be specified fully and clearly in the purchase order, so that the valve manufacturer can prepare and suggest suitable measures.
Such measures may, for example, influence

- material selection
- wall thickness
- special designs.

CAUTION
The valves and pneumatic actuators must not be operated beyond the permissible application range. The limit values are specified on the valve's name plate or the valid type leaflet. Above all, the values given in the pressure-temperature tables must not be exceeded. Operation of the valves and pneumatic actuators outside the above-mentioned conditions may result in overloads which, in turn, may damage the valves and the actuators.


Non-observance of this warning may cause personal injury and damage to property, for example:

- injuries resulting from fluid leakage (cold/hot, toxic, under pressure, . .),
- impairment of the valve's or pneumatic actuator's function or its destruction.

The descriptions and instructions set forth in this manual refer to the standard models but are also applicable to variants.

For actuated valves with supplied actuators of external suppliers, the operating manual of the actuator must be adhered to without fail.

These operating instructions do not take into account:

- any eventualities and events which might occur during installation, operation and maintenance,
- local safety regulations; the operator must ensure that such regulations are strictly observed by all, including the personnel called in for installation.

CAUTION
The valve or pneumatic actuator must only be operated by skilled, properly trained personnel.

Incorrect operation of the valve or of the pneumatic actuator may have a substantial impact on the entire system, for example:
- leakage of the fluid handled,
- system / machine brought to a standstill
- impairment / reduction / increase of the system's / machine's function / effect.

For any queries you may have or in the case of damage, please contact the manufacturer.

For any queries and repeat orders, in particular for purchasing spare parts, please specify the type series / variant details, the order number, as well as the year of construction, if possible.

The technical data (operating data) of the valves or of the pneumatic actuators is specified in the technical literature (type leaflet, valve characteristic, chemical resistance chart) of the concerned valve or the concerned pneumatic actuator (cf. section 5).

3. Safety

These operating instructions contain fundamental information which must be complied with during installation, operation and maintenance. Therefore this operating manual must be read and understood both by the installing personnel and the responsible trained personnel / operators prior to installation and commissioning, and it must always be kept close to the location of operation of the valve resp. the pneumatic actuator for easy access.

Not only must the general safety instructions laid down in this chapter on "Safety" be complied with, but also the safety instructions outlined under specific headings.

3.1 Marking of instructions in the manual

The safety instructions contained in this manual whose non-observance might cause hazards to persons are specially marked with the general hazard sign, namely


safety sign in accordance with DIN 4844 – W 9.

The electrical danger warning sign is


safety sign in accordance with DIN 4844 – W 8.

The word

CAUTION

is used to introduce safety instructions whose non-observance may lead to damage to the valve or the pneumatic actuator and its functions.

Instructions attached directly to the valve or the pneumatic actuator (e. g. nominal pressure) must always be complied with and be kept in a perfectly legible condition at all times.

3.2 Personnel qualification and training

All personnel involved in the operation, maintenance, inspection and installation of the equipment must be fully qualified to carry out the work involved. Personnel responsibilities, competence and supervision must be clearly defined by the operator. If the personnel in question is not already in possession of the requisite know-how, appropriate training and instruction must be provided. If required, the operator may commission the manufacturer / supplier to take care of such training. In addition, the operator is responsible for ensuring that the contents of the operating instructions are fully understood by the responsible personnel.

3.3 Non-compliance with safety instructions

Non-compliance with safety instructions can jeopardize the safety of personnel, the environment and the valve or the pneumatic actuator itself. Non-compliance with these safety instructions will also lead to forfeiture of any and all rights to claims for damages.

In particular, non-compliance can, for example, result in:

- failure of important valve or pneumatic actuator / system functions,
- failure of prescribed maintenance and servicing practices,
- hazard to persons by electrical, mechanical and chemical effects,
- hazard to the environment due to leakage of hazardous substances

3.4 Safety awareness

It is imperative to comply with the safety instructions contained in this manual, the relevant national health and safety regulations and the operator's own internal work, operation and safety regulations.

3.5 Safety instructions for the operator / user

Any hot or cold valve components (e. g. body components or handwheel) that could pose a hazard must be equipped with a guard by the operator.

Guards which are fitted to prevent accidental contact with moving parts (e.g. coupling) must not be removed whilst the unit is operating.

Leakages (e.g. at the stem seal) of hazardous media handled (e.g. explosive, toxic, hot) must be contained so as to avoid any danger to persons and the environment. All relevant laws must be heeded.

Electrical hazards must be eliminated. (For details please refer to VDE regulations and the safety regulations laid down by the local energy supply companies, for instance).

3.6 Safety instructions for maintenance, inspection and installation work

The operator is responsible for ensuring that all maintenance, inspection and installation work be performed by authorized, qualified specialist personnel who are thoroughly familiar with the manual.

As a rule, work on actuated valves or on pneumatic actuators, must only be carried out after the valve has cooled down and valve pressure has been released. The fluid temperature must be below the vaporization temperature limit in all areas in contact with the fluid.

Work on (actuated) valves or pneumatic actuators must be carried out only during standstill. The shutdown procedure described in the manual for taking the valve out of service must be adhered to without fail.

Valves handling fluids injurious to health must be decontaminated.

Immediately following completion of the work, all safety-relevant and protective devices must be re-installed and / or re-activated.

Please observe all instructions set out in section 7 "Commissioning / Start-up" before returning the valve to service.

3.7 Unauthorized modification and manufacture of spare parts

Modifications or alterations of the valve or the pneumatic actuator supplied are only permitted after consultation with the manufacturer. Original spare parts and accessories authorized by the manufacturer ensure safety. The use of other parts can invalidate any liability of the manufacturer for consequential damage.

3.8 Unauthorized modes of operation

The warranty relating to the operating reliability and safety of the valve und the pneumatic actuator supplied is only valid if the equipment is used in accordance with its designated use as described in section 2 "General instructions" of this manual. The limits stated in the technical literature must not be exceeded under any circumstances.

4. Transport and storage

The valves and pneumatic actuators are delivered ready for operation. The line connection ports are closed with suitable material (caps, plugs, covers).

4.1 Corrosion protection

As a standard, all valves and linear actuated pistons made of material not resistant to corrosion are painted with a primer which offers adequate corrosion protection under ambient atmosphere conditions normally encountered in buildings.
If the valves are used in a corrosion-inducing atmosphere, the user must apply a protective coating on site.

4.2 Transport

Suitable precautions shall be taken to prevent damage during transport.

CAUTION The valves must never be suspended by the handwheel or by the actuator, if any, except linear actuated pistons with ring bolts.

For transporting large valves, ropes shall be attached to the yoke arms or to the bolted bonnet/cover.

Valves with actuators shall be transported by means of ropes attached to the piping flanges, taking into account the centre of gravity.

Use any lifting lugs provided.

For the valve or pneumatic actuator weights refer to the relevant manufacturer documentation (type leaflet - section 5.2 "Order confirmation").

After delivery and prior to installation, check the valve or the pneumatic actuator for potential damage acquired in transit.

4.3 Storage

Storage / interim storage of the valves or pneumatic actuators must ensure that even after a prolonged period of storage the valves' or pneumatic actuators' function is not impaired. The following requirements must be met:

- Storage is performed with the valve in the closed position (to protect the sealing surfaces against damage),
- Measures are taken to protect the valves against dirt, humidity, frost and corrosion (e.g. by using foils or caps; storage in dry rooms).

5. Description / Related documents

5.1 Description

The valves are marked in accordance with the Pressure Equipment Directive 97/23/EC and the pertinent standards on valve types/design, as well as TRD 110 (German Steam Boiler Regulations) and TRB 801 No. 45 (German Pressure Vessel Regulations).

Marking includes as a minimum:
- manufacturer
- year of construction
- type or order no.
- DN
- PN or max. permissible pressure/temperature
- material

The CE marking on the valve means it is in conformity with the European Pressure Equipment Directive 97/23/EC.

5.1.2 Description

Type plate with:
- name of series
- size of actuator, spring, stroke
- Pmax (max. air supply pressure)
- Identno.

Actuators with preloaded springs must be equipped with a danger sign:

"Caution! Preloaded spring. Do not dismantle!

Class	PN	DN									
		≤25	32	40	50	65	80	100	125	150	≥200
150	10										
	16										
≥300	25										
	≥40										

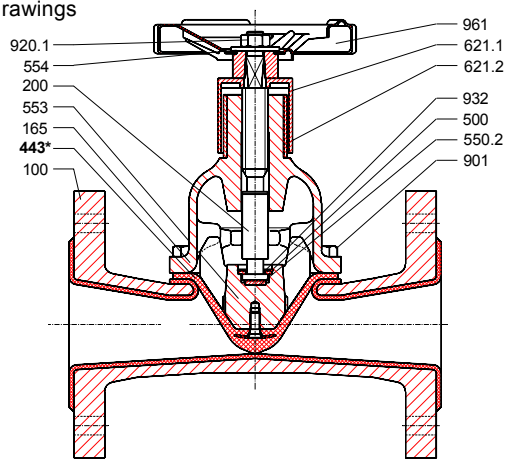
5.2 Drawings / Documentation

The sectional drawings below provide examples of the general design / configuration of the valves and pneumatic actuators. For illustrations relating to specific valve series and further information please refer to the respective type leaflets.

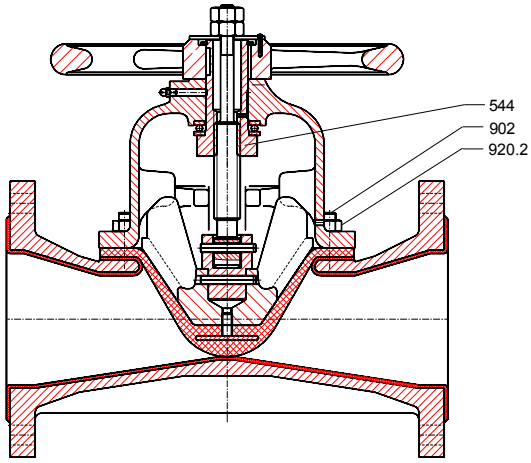
5.2.1 Diaphragm valves with handwheel for industry and building services

Type	DN	PN	Material	Type leaflet No.
SISTO®-KB	015-200	10	as specified in the type leaflet	8651.1
SISTO®-10	015-300 Rp 1/2“-3“	10	as specified in the type leaflet	8641.1
SISTO®-16 HWA / DLU / TWA	015-200	16	as specified in the type leaflet	8635.33
SISTO®-16 / 16-S	015-200	16	as specified in the type leaflet	8635.1
SISTO®-20	015-200	16	as specified in the type leaflet	8643.1
SISTO®-16 RGA	015-050 Rp 1/2“-3“	16	as specified in the type leaflet	8638.1

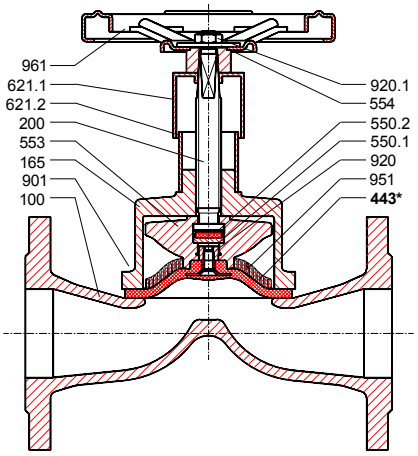
Sectional drawings



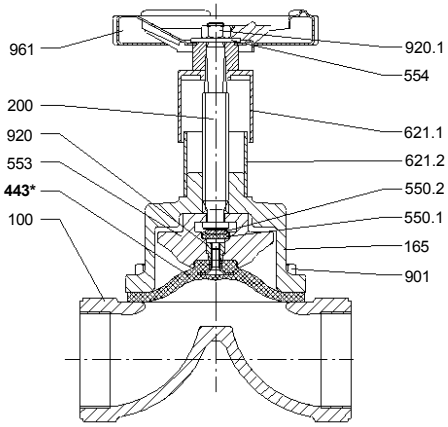
SISTO®-KB
Model DN 015-100



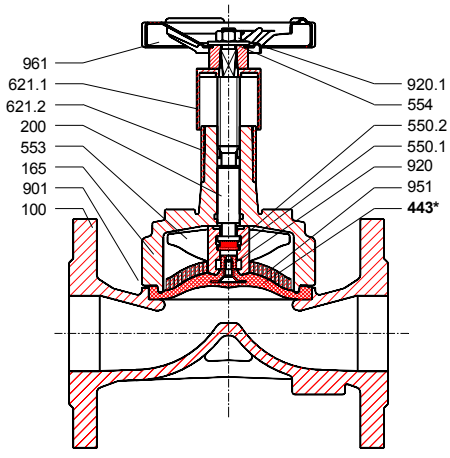
SISTO®-KB
Model DN 125-200
as a variant DN 015-100



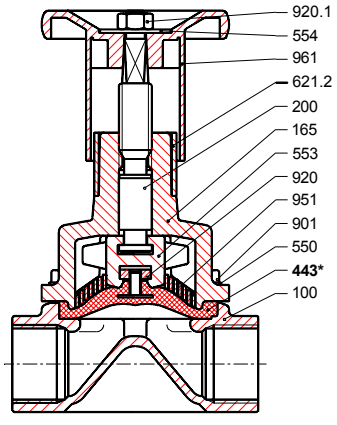
SISTO®-10



SISTO®-10 socket



SISTO®-16 HWA/DLU/TWA
SISTO®-16/16S

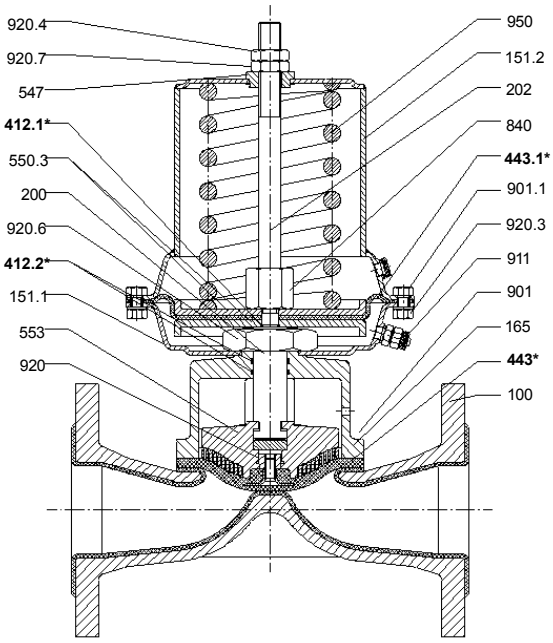


SISTO®-16 RGA

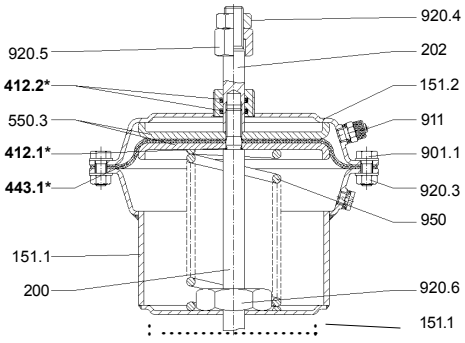
5.2.2. Diaphragm valves with pneumatic diaphragm actuator for industry and building services resp. pneumatic actuator without valve

Type	DN	PN	Material	Type leaflet No.
SISTOMAT®-PC SISTO®-KB	015-100	10	as specified in the type leaflet	8651.1 PC
SISTOMAT®-PC SISTO®-10	015-125	10	as specified in the type leaflet	8641.1 PC
SISTOMAT®-PC SISTO®-16/16S/20	015-125	16	as specified in the type leaflet	8635.1 PC

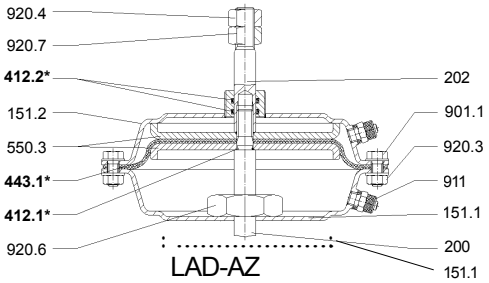
Sectional drawings



SISTOMAT® LAD-SF



LAD-OF

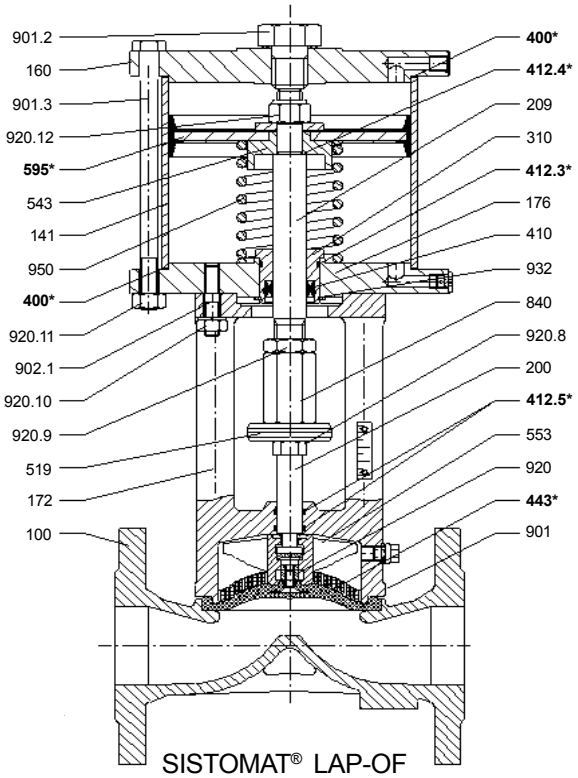


LAD-AZ

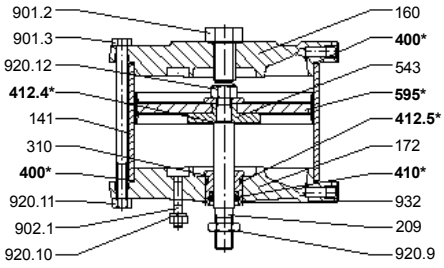
5.2.3. Diaphragm valves with pneumatic piston actuator for industry and building services resp. linear actuated pistons without valve

Type	DN	PN	Material	Type leaflet No.
SISTOMAT®-P SISTO®-KB	015-100	10	as specified in the type leaflet	9210.1
SISTOMAT®-P SISTO®-10	015-125	10	as specified in the type leaflet	9210.1
SISTOMAT®-P SISTO®-16/16S/20	015-125	16	as specified in the type leaflet	9210.1

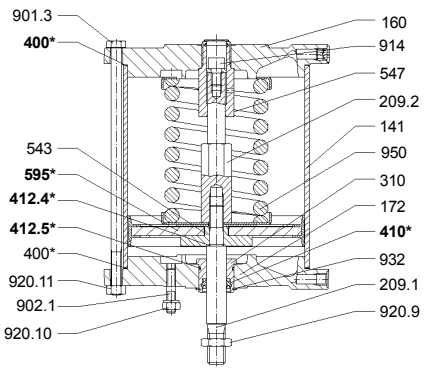
Sectional drawings



SISTOMAT® LAP-OF



LAP-AZ

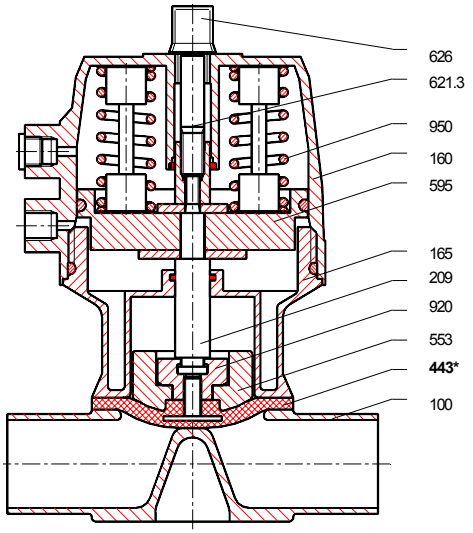


LAP-SF

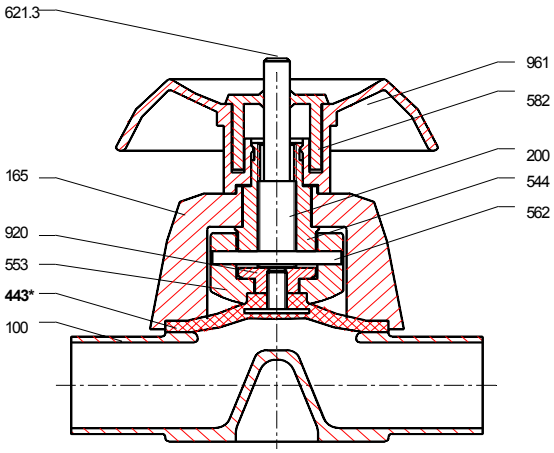
5.2.4. Diaphragm valves with handwheel or pneumatic actuator for sterile processes

Type	DN	PN	Material	Type leaflet No.
SISTO®-LC	015-050	10	as specified in the type leaflet	8645.1
SISTO®-B	015-050	10	as specified in the type leaflet	8646.1
SISTO®-C	006-150	16	as specified in the catalogue	8644.178

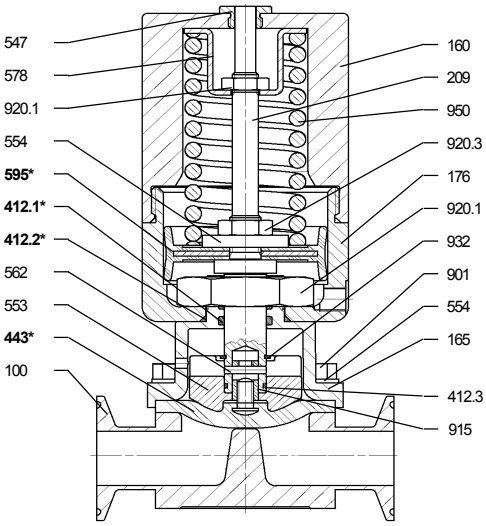
Sectional drawings



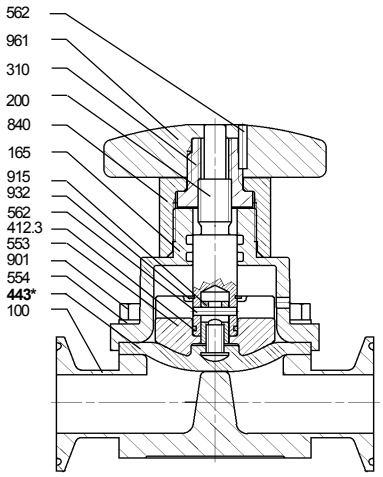
SISTO®-LC with pneumatic actuator
Function: Spring to close, type LAP-SF



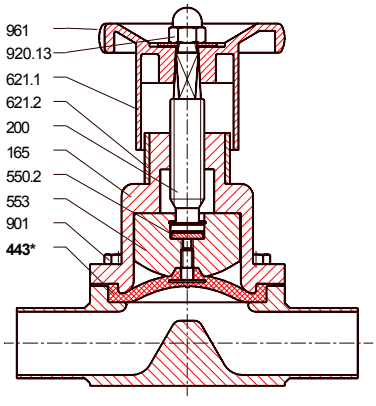
SISTO®-LC with handwheel



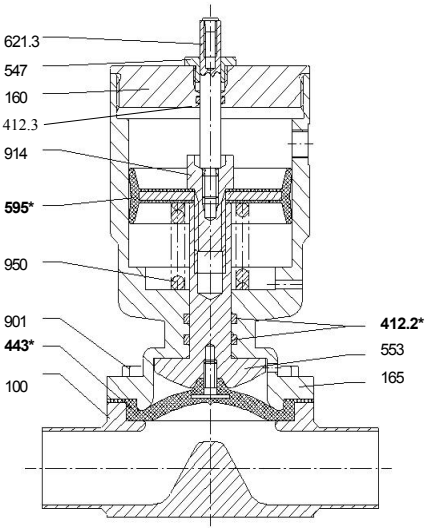
SISTOMAT-P SISTO®-B with pneumatic actuator
Function: Spring to close, type LAP-SF



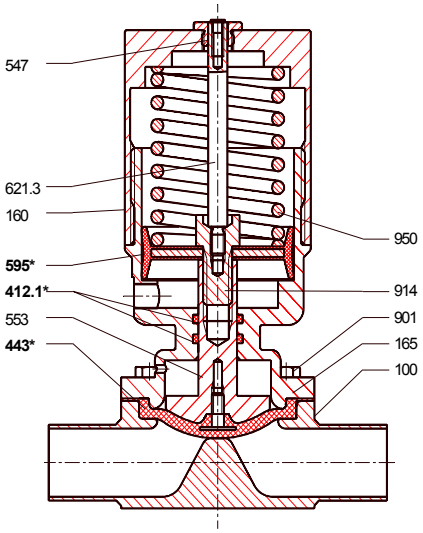
SISTO®-B with handwheel



SISTO®-C with handwheel



SISTOMAT SISTO®-C with pneumatic actuator
Function: Spring to open, type LAP-OF

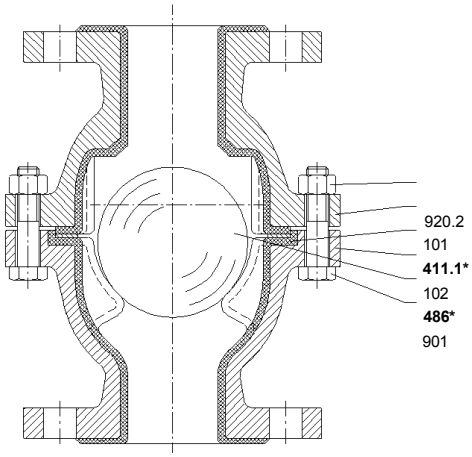


SISTOMAT SISTO®-C with pneumatic actuator
Function: Spring to close, type LAP-SF

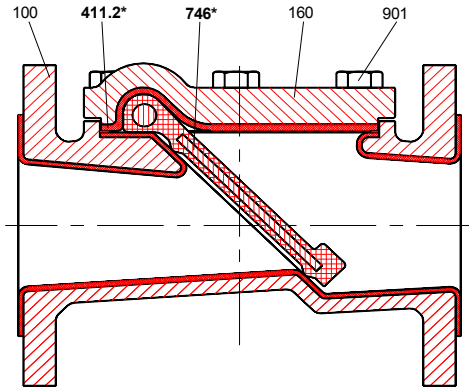
5.2.5. Check valves for industry and building services

Type	DN	PN	Material	Type leaflet No.
KRV	020-200	10	as specified in the type leaflet	8671.1
RSK/RSK-S	025-200	16	as specified in the type leaflet	8675.1
	250-300	10	as specified in the type leaflet	8675.1

Sectional drawings



KRV



RSK/RSK-S

5.3 List of components

Part No.	Description	Part No.	Description
100	Body	553	Compressor
101	Upper body	554	Washer
102	Lower body	562	Paralell pin
141	Cylinder	578	Spring guiding
151	Actuator bottom	**595***	**Piston**
151.1	Actuator bottom with ISO-coupling-flange	621.1	Upper opening indicator
152	Actuator cover	621.2	Lower opening indicator
160	Cover	621.3	Opening indicator
165	Bonnet	626	Sight glass
172	Bonnet assembly	**746***	**Valve disc**
176	Bottom flange	840	Coupling
200	Stem	901	Hexagon head bolt
202	Sliding stem	901.1	Hexagon head bolt
209	Piston rod	901.2	Hexagon head bolt
209.1	Lower piston rod	901.3	Hexagon head bolt
209.2	Upper piston rod	902	Stud
310	Sliding bush	902.1	Stud
400*	**Gasket**	911	Air supply port
410*	**Set of gaskets**	914	Socket head cap screw
411.1*	**Joint ring**	915	Discharge nut
411.2*	**Joint ring**	920	Square nut
412.1*	**O-Ring**	920.1	Hexagon nut
412.2*	**O-Ring**	920.2	Hexagon nut
412.3*	**O-Ring**	920.3	Hexagon nut
412.4*	**O-Ring**	920.4	Hexagon nut
412.5*	**O-Ring**	920.5	Hexagon nut
443*	**Diaphragm**	920.6	Hexagon nut
443.1*	**Actuator diaphragm**	920.7	Hexagon nut
486*	**Ball**	920.8	Hexagon nut
500	Ring	920.9	Hexagon nut
519	Position indicator	920.10	Hexagon nut
543	Spacer bush	920.11	Hexagon nut
544	Threaded bush	920.12	Hexagon nut
547	Guide bush	920.13	Hexagon nut
550	Disc	932	Ciclip
550.1	Disc	950	Spring
550.2	Disc	951	Support spiral
550.3	Diaphragm plate	961	Handwheel

*** Recommended spare parts**

5.4 Function

5.4.1 Diaphragm valves with handwheel for industry and building services

The valves consist of the pressure-retaining parts, i.e. body (100) and bonnet (165), and the functional unit.

The body (100) and bonnet (165) are connected by hexagon head bolts (901) or studs (902) and nuts (920.2).

The functional unit consists of bonnet (165), handwheel (961), stem (200), compressor (553) with square nut (920) and diaphragm (443).

5.4.2 Diaphragm valves with pneumatic diaphragm actuator for industry and building services resp. pneumatic actuators without valves

Diaphragm valves with pneumatic diaphragm actuator resp. pneumatic actuators without valves are available in spring to close (SF), spring to open (OF) and double-acting (AZ) design.

The valves consist of the pressure-retaining parts, i.e. body (100) and bonnet (165), and the functional unit.

The body (100) and actuator or bonnet (165) are connected by hexagon head bolts (901) or studs (902) and hexagon nuts (920.2).

The diaphragm actuator functional unit consists of bonnet (165), actuator cases (151.1/151.2), actuator diaphragm (443.1) with diaphragm plate (550.3), spring (950) (for OF and SF designs), stem (200), sliding stem (202), compressor (553) with square nut (920) and diaphragm (443).

The actuator diaphragm unit without valve consists of the actuator bottom (151.1) with ISO-coupling flange, the actuator cover (152), the actuator diaphragm (443.1), the diaphragm plates (550.3), the spring (950), the upper piston road (209) and the sliding stem (202).

5.4.3 Diaphragm valves with pneumatic piston actuator for industry and building services

Diaphragm valves with pneumatic piston actuator are available in spring to close (SF), spring to open (OF) and double-acting (AZ) design.

The valves consist of the pressure-retaining parts, i.e. body (100) and bonnet assembly (172), and the functional unit.
The body (100) and actuator or bonnet assembly (172) are connected by hexagon head bolts (901) or studs (902) and hexagon nuts (920.2).

The piston actuator functional unit consists of bonnet assembly (172), cylinder (141), piston (595), spring (950) (for OF and SF designs), piston rod (209), sliding stem (202), compressor (553) with square nut (920) and diaphragm (443).

The actuator piston unit without valve consists of the actuator bottom plate (176) with ISO-coupling-flange, the calinder (141), the actuator cover plate (160), the piston with sealing ring (595), the spring (950), the upper piston road (209) and the sliding stem (202).

5.4.4 Diaphragm valves with handwheel or pneumatic actuator for sterile processes

Diaphragm valves for sterile process are either of the SISTO®-C, SISTO®-LC and SISTO®-B type.

The valves consist of the pressure-retaining parts, i.e. body (100) and bonnet (165), and the functional unit. The body (100) and actuator or bonnet (165) are connected by hexagon head bolts (901). The functional unit of diaphragm valves with handwheel consists of bonnet (165), handwheel (961), stem (200), compressor (553) and diaphragm (443).

The functional unit of SISTO®-C diaphragm valves with pneumatic actuator consists of the pneumatic piston actuator (SF, OF, AZ). The piston actuator consists of bonnet (165), cover (160), compressor (553), socket head cap screw (914), opening indicator (621.3), piston (595) and diaphragm (443).

The functional unit of SISTO®-LC diaphragm valves with pneumatic actuator consists of the pneumatic piston actuator (SF, OF). The piston actuator consists of bonnet (165), cover (160), compressor (553), stem (200), piston rod (209), opening indicator (621.3), piston (595) and diaphragm (443).

The functional unit of SISTO®-B diaphragm valves with pneumatic actuator consists of the pneumatic piston actuator (SF). The piston actuator consists of bonnet (165), compressor (553), piston rod (209), bottom flange (176), cover (160), piston (595), spring (950), spring guiding (578) and diaphragm (443).

5.4.5 Check valves for industry and building services

Check valves for industry and building services are either of the disc or ball type.

The RSK/RSK-S swing check valve consists of body (100), cover (160), joint ring (411.2) and valve disc (746). Cover (160) and body (100) are connected by hexagon head bolts (901). The upper end of the valve disc (746) is tightly clamped between cover (160) and body (100) allowing the lower end to move freely in the swing check valve's flow path. This ensures that the valve disc (746) is pressed against the seat in one direction, preventing throughflow.

The KRV ball non-return valve consists of upper body (101), lower body (102) and ball (486). The upper body (101) and the lower body (102) are connected by hexagon head bolts (901) and hexagon nuts (920.2). The ball (486) is located beween the upper body (101) and lower body (102). This ensures that the ball (486) is pressed against the seat in one direction, preventing throughflow. A joint ring (411.1) is placed between the upper body (101) and the lower body (102) to effect sealing to atmosphere.

6. Installation

6.1 General

As a rule, the engineering contractor, construction company or operator / user are responsible for the positioning and installation of the valves or the pneumatic actuators.

Planning and installation errors may impair the reliable function of the valves or the pneumatic actuators and pose a substantial safety hazard. Compliance with the following requirements is of particular importance:

CAUTION The piping must be laid such that detrimental thrust and torsional forces are kept away from the valve bodies during installation and operation to avoid impairment of valve function and/ or valve rupture.

CAUTION The caps on the connection ports shall be removed immediately prior to installation.

When painting the pipelines and valves, do not apply paint to the bolts, stems and plastic components (valve function will be impaired). If construction work is still in progress, the valves and the pneumatic actuators must be protected against dust, sand and building material (cover with suitable material).

Do not use valve handwheels as footholds.

For safety reasons, valves and piping systems operated at high (> 50° C) or low (< 0° C) temperatures must be insulated, or a warning sign must point out the risk of personal injury involved when touching the hot or cold components.

Valves and pneumatic actuators with external moving elements must be fitted with protective covers, or other suitable measures must be taken to prevent accidents.

Valves used as dead-end valves in a pipeline should be protected against unauthorized or unintentional opening, to prevent damage to property and/or personal injury as well as environmental damage.

6.2 Installation position

The valve bodies are marked with an arrow indicating flow direction, if necessary. The valves must be installed such that the flow direction of the fluid corresponds to the direction shown by the arrow cast on the valve body. If no directional arrow is cast on the valve body, the valve can be installed in any position.

6.2.1 Diaphragm valves

Diaphragm valves can be installed in any position. However, the best installation position is with the stem pointing vertically upwards.

6.2.3 Check valves

RSK/RSK-S swing check valves must always be installed such that the flow direction of the fluid corresponds to the direction shown by the arrow cast on the cover (160).
KRV ball non-return valves must always be installed such that the flow direction of the fluid corresponds to the direction shown by the arrow cast on the upper body (101).

6.2.4 Special designs

For the positioning and installation of special design valves, please contact the engineering contractor, construction company or operator / user.

6.3 Installation instructions

6.3.1 Flanged valves

The mating flange faces must be clean and undamaged.

⚠ Align the flanges carefully before tightening the bolts. The gaskets on the mating flanges must be properly centered. Only connection and sealing elements made of approved materials shall be used. Fitting with PTFE lining should not be used with metallic seal. Valves with softrubber lining resp. PTFE-lining can be used, for reason of their material property, without additional seal. For the flange connection between valve and pipe use all flange bolt holes provided.

Use suitable tools to tighten the bolts evenly and crosswise at the permissible torques (see section 10).

6.3.2 Welding instructions

Responsibility for welding the valves into the piping and for any heat treatment required lies with the pipeline contractor.

CAUTION When welding valves with butt or socket weld ends into the piping or when performing welding jobs on a pipeline after the valves have been installed (pipeline installation) make sure that no contamination enters the valve body to prevent damage to the linings or diaphragms.

CAUTION When welding the valve into the pipeline, take special care, e.g. welding in several steps and at high welding speed, so that the temperature rise in the middle of the valve body does not exceed the max. permissible operating temperature. The bonnet including diaphragm must be dismantled prior to welding the valve body.

CAUTION To prevent scorching, the welding cables must not be attached to functional valve elements or valve surfaces that have to meet specific roughness requirements.

On valves with socket weld ends, the insertion depth given in the applicable technical code must be complied with. A gap between the pipe end and the socket base will prevent impermissible stresses in the weld.

6.4 Valves with actuator

Valves with transmission gear and/or actuators and pneumatic actuators on external valves must be installed with the stem in vertical position, if possible. If this requirement cannot be met, adequately support the actuator on site or consult the manufacturer.

⚠ Electrical connection shall be effected by suitably trained personnel only.

VDE 0100 and VDE 0165 (explosion protection) regulations must be adhered to!

All electrical equipment such as actuator, control panel, solenoid valve, limit switch, etc. must be installed in dry flood-proof rooms.

Voltage and frequency must correspond to the data on the name plate.

6.5 Insulation

If the valve is to be insulated, make sure that the insulation does not impair the function of the valve. In particular, make sure that the sealing areas at the cover / bonnet joints and at the stem passage are easily accessible and visible.

7. Commissioning / Start-up / Shutdown

(Please also refer to section 6 „Installation“)

7.1 Commissioning / Start-up

7.1.1 General

Prior to commissioning / start-up compare the material, pressure and temperature data on the valves with the operating conditions of the piping to check the material's chemical resistance and stability under load.

⚠ Surge pressure (water hammer), which might occur, must not exceed the max. permissible pressure. Safety measures are required to be taken by the operator / user.

In new systems and particularly after repair, the complete piping system must be thoroughly flushed with the valves fully opened so that particles and / or welding beads that might damage the valve are removed.

If the piping system is cleaned by means of a pickling procedure, responsibility for the compatibility of the pickling media used and the pickling procedure itself lies with the pickling company.

Venting the valve by undoing the bonnet/cover bolting is dangerous and therefore not permitted.

To prevent damage to the valve material or joint seals, the usual start-up and shutdown velocities must be adhered to.

7.1.2 Valve actuation

The valves are closed by turning the handwheel in clockwise direction and opened by turning it in counter-clockwise direction (top view).

CAUTION Valves with handwheels may only be actuated by hand. As the valve can be damaged by applying excessive forces, it is not allowed to use additional levers to move the handwheel.

Shut-off valves are normally used in such a way that they are either fully open or fully closed.

7.1.3 Functional test

The following functions must be checked:

Check the shut-off function of the installed valves prior to commissioning / start-up by opening and closing them several times.
If required, evenly re-tighten the cover / bonnet bolting as well as the bolting at the mating flanges.

CAUTION Open the valve by two full handwheel turns before re-tightening the cover / bonnet bolting to avoid stress or distortion.

7.1.4 Valves with actuator

On valves with electric / pneumatic actuators, the strokes / actuating forces must be limited.

Electric actuators are factory-set ready for operation. They shall be wired as follows:

Globe valve “CLOSE” torque-dependent
Globe valve “OPEN” travel-dependent

The wiring diagrams are given in the terminal boxes.

For pneumatic actuators, the control pressures specified in the order shall be complied with. Non-observance may damage the actuator.

Closing and opening torques or actuating forces shall be enquired from the manufacturer, if necessary.

7.2 Shutdown

In the event of prolonged shutdowns, fluids which change their physical condition due to changes in concentration, polymerization, crystallization, solidification, etc. must be drained from the piping. If required, flush the piping with the valves fully opened.

8. Servicing / Maintenance

8.1 Safety instructions

Repair and maintenance work must only be performed by skilled, properly trained personnel taking into account the relevant health and safety regulations.

It is imperative that the below safety instructions and the general information on safety as per section 3 “Safety” be observed for all servicing and maintenance work to be performed.

CAUTION Always use suitable spare parts and tools, even in emergencies, to ensure proper functioning of the valves or of the pneumatic actuators.

8.1.1 Valve dismantling

Before removing the complete valve from the pipeline or before repair or maintenance work to the valve itself, i.e.

- prior to undoing the flange bolting between valve and pipe
- prior to undoing the cover / bonnet bolting
- prior to removing any drain or vent plugs
- prior to removing a bolted actuator

valve pressure must be released and the valve must be allowed to cool down such that the temperature is below the fluid’s vaporization temperature in all areas in contact with the fluid in order to effectively prevent any risk of scalding.


Danger of death when opening a valve under pressure!

If toxic or easily inflammable fluids were handled, or fluids whose residues may cause corrosion in conjunction with air humidity, drain the valve and flush or vent it.

If required, wear safety clothing and a protective mask!

Depending on the installation position, fluid residues may be left in the valve; these must be collected and properly disposed of.
Prior to any transport, flush and drain the valve thoroughly.
If you have any questions please contact the manufacturer.

8.1.2 Removing actuators


If actuators powered by an external source of energy (electric, pneumatic) need to be removed from the valves or dismantled, the energy supply must be shut down prior to starting any work and the instructions in sections 3, 8.1.1 and the operating manual of the actuator must be observed.


Actuators with integrated spring mechanism contain preloaded springs. They shall only be dismantled with extreme care, using the requisite locking devices.

If you have any questions please contact the manufacturer.

8.2 Maintenance

All valves and pneumatic actuators components have been designed to be largely maintenance-free. The materials of the moving parts have been selected for minimum wear. To ensure reliable operation and to reduce repair costs, however, all valves and pneumatic actuators should be checked regularly, particularly those rarely used or difficult to access.

On diaphragm valves, the diaphragm is the highest stressed component.
On RSK/RSK-S swing check valves, the valve disc is the highest stressed component.
On KRV ball non-return valves, the ball is the highest stressed component.
The highest stressed components (diaphragm, valve disc, ball) are not only subject to mechanical stress but also to wear caused by the medium. We recommend to regularly check these wear parts at intervals to be individually stipulated depending on service conditions and actuation frequency.

- For checking the diaphragm, remove the bonnet from the body. See also section 8.3 „Replacing the diaphragm“.

- For checking the valve disc, remove the cover from the body. See also section 8.4 „Replacing the valve disc“.

- For checking the ball, remove the upper body from the lower body. See also section 8.5 „Replacing the ball“.

Despite the high safety standards, we recommend replacement of the relevant wear part no later than 5 years of service (depending on the operating conditions.)

The operator/user is responsible for fixing appropriate inspection and servicing intervals as required by the service conditions of the valves and pneumatic actuators.

The service life of valves and pneumatic actuators can be prolonged by:

- actuating the valve (open-close) at least once or twice a year
- lubricating the movable parts (not for oxygen valves) with standardized lubricants to DIN 51825.

The safety instructions in sections 3, 8.1 and the instructions in section 9 must be complied with.

8.3 Replacing the diaphragm

8.3.1 Replacing the diaphragm of diaphragm valves with handwheel for industry and building services

Undo hexagon head bolts (901) or studs (902) and hexagon nuts (920.2) to dismantle the bonnet. Unscrew diaphragm (443) from compressor (553) and square nut (920) by turning counter-clockwise. When fitting the replacement diaphragm refer to the material marking on the diaphragm. Effect reassembly in reverse order. Hexagon head bolts (901) must be evenly tightened crosswise.

8.3.2 Replacing the diaphragm of diaphragm valves with pneumatic diaphragm actuator for industry and building services

The valve bonnet can only be dismantled together with the actuator. Spring to close (SF) actuators must be pressurized to open the valve whereas on spring to open (OF) and double-acting (AZ) actuators the pressure must be released.
Undo hexagon head bolts (901) or stud (902) and hexagon nut (920.2) to dismantle bonnet with actuator. Unscrew diaphragm (443) from compressor (553) and square nut (920) by turning counter-clockwise. When fitting the replacement diaphragm refer to the material marking on the diaphragm. Effect reassembly in reverse order. Hexagon head bolts (901) must be evenly tightened crosswise.

Replacing the actuator diaphragm of diaphragm actuators type LAD (see section 5.2.2)

Spring to close (SF) and spring to open (OF) designs

CAUTION These actuators feature pre-loaded springs.

SF+OF Vent actuator and separate from the air supply system. Undo four opposite hexagon nuts (920.3) and replace the four hexagon head bolts (901.1) by suitable tie bolts. Tighten the four hexagon nuts (920.3) on the tie bolts as far as they will go. Unscrew the remaining hexagon nuts (920.3) around the actuator case from the bolts (901.1).

SF Unscrew hexagon nuts (920.4/920.7) from the sliding stem (202).

OF Unscrew the sliding stem (202) secured with Loctite from the stem (200) using the locked hexagon nut (920.4).

SF+OF Evenly undo the four hexagon nuts (920.3) on the tie bolt until the spring (950) tension is relieved. Remove the upper actuator case (151.2).

SF Unscrew the coupling (840) secured with Loctite together with the sliding stem (202) from the stem (200).

SF+OF Withdraw the upper diaphragm plate (550.3). Replace the defective actuator diaphragm (443.1). Effect reassembly in reverse order. Connect actuator to air supply system.

Double-acting design: air to close, air to open (AZ)

- Vent actuator and separate from air supply system.
- Unscrew all hexagon nuts (920.3) from the upper actuator case (151.2).
- Unscrew the sliding stem (202) from the stem (200) using locked hexagon nut (920.4/920.7).
- Withdraw the upper diaphragm plate (550.3).
- Replace the defective actuator diaphragm (443.1).
- Effect reassembly in reverse order.
- Connect actuator to air supply system.

Note:
When tightening the coupling (840) / sliding stem (202) on the stem (200), make sure to secure the connection with Loctite „medium“ again and take care that the bolt holes of the diaphragm and the bolt holes of the actuator case (151.1) register. Ensure that the actuator diaphragm does not pucker. The stem (200) is secured against rotation by a flat end in the compressor (553).

CAUTION The hexagon nuts (920.4/920.7) act as a travel stop in closing direction. They should be set so as to ensure that the valve closes tightly at the relevant operating pressure. If during the functional check in the line with a valve under pressure the hexagon nut (920.4) / hexagon nut (920.7) is found to rest on the upper actuator case (151.2), take the actuator to the open position and unscrew the hexagon nuts (920.4/920.7) from the sliding stem (202) by approx. one half-turn. Then lock the hexagon nuts again, tightly gripping the lower hexagon nut (920.7).

8.3.3 Replacing the diaphragm of diaphragm valves with pneumatic piston actuator for industry and building services: Type LAP (see section 5.2.3)

Undo hexagon head bolts (901.1) to dismantle the bonnet assembly. Unscrew diaphragm (443) from compressor (553) / square nut (920) by turning counter-clockwise. When fitting the replacement diaphragm refer to the material marking on the diaphragm. Effect reassembly in reverse order. The hexagon head bolts (901.1) must be evenly tightened crosswise.

Dismantling of a pneumatic actuator from a valve/ reassembling of the pneumatic actuator on a valve

Dismantling
- Vent actuator and separate from air supply system.
- Loosen hexagon nut (920.9) (approx. one turn).
- Unscrew hexagon nuts (4 pcs.) (920.11).
- Turn coupling (840) clockwise, using a suitable tool, until the piston rod (209/209.1/209.2) is completely screwed out.
- Lift actuator off bonnet assembly(172).

Safety instructions

- Further dismantling of spring-loaded actuators may only be carried out at the delivering factory.

- Actuators of the spring to open / spring to close type are fitted with a spring mechanism. The studs (902.1) serving as tie bolts must never be cut or undone.

Reassembly of the pneumatic actuator

Installation of pneumatic actuator type LAP

- Align actuator with bolt circle of bonnet assembly (172) using stud (902.1) and place actuator on the bonnet assembly (172) (caution: mind the position of the air supply port).
- Tighten hexagon nut (920.10) crosswise.
- Screw coupling (840) onto piston rod (209/209.1) (3 to 4 threads). If required, cautiously move piston rod (209) (OF/ AZ) in the closed direction using compressed air.
- Take actuator to the open position using compressed air. Screw coupling (840) onto piston rod (209/209.1) as far as it will go; then back off one full turn.
- Lock hexagon nut (920.9) on coupling (840).
- Connect actuator to air supply system.

CAUTION If during the functional check in the line with a valve under pressure the hexagon nut (920.9) is found to rest on the bonnet assembly (172), the valve probably leaks in the passage. To remedy the fault, take the actuator to the open position, undo the hexagon nut (920.9) and unscrew the stem (200) from the coupling (840) by approx. one half-turn. Then lock hexagon nut (920.9) on coupling (840) again.

8.3.4 Replacing the diaphragm of diaphragm valves with handwheel or pneumatic actuator for sterile processes

Replacing the diaphragm of SISTO®-C

On diaphragm valves, the diaphragm is the highest stressed component.
The diaphragm is not only subject to mechanical stress but also to wear caused by the medium. We recommend to regularly check the diaphragm at intervals to be individually stipulated depending on service conditions and actuation frequency. For checking the diaphragm, remove the bonnet from the body.

- Take valve to the open position.

- Undo hexagon head bolts (901) to dismantle the bonnet (165).

- Take valve to the closed position. To do so, turn handwheel (961) clockwise on manually actuated valves; supply compressed air to the upper control air supply port on actuators with air to open/air to close function and spring to open function; release the air from the actuator in case of actuators with spring to close function.

- Turn counter-clockwise to dismantle diaphragm (443) with fastening thread. Diaphragms marked „MD 30“ and „MD 40“ with an „N“ added after the indication of the elastomer quality and featuring a fastening button on the back of the diaphragm are buttoned into the compressor by means of this button. Simultaneous pulling and turning on one side will easily remove the diaphragm (443) from the compressor.

- Proceed as follows to fit the new diaphragm (443): Prior to installation, remove protection from fastening grub screw of the diaphragm, if applicable. Always screw in the diaphragm as far as it will go, i.e. until it rests against the compressor (553); back it off by a maximum of 90°. Prior to mounting the bonnet (165) on the valve body (100), take the valve to the open position. Place bonnet (165) with diaphragm on the body (100) and tighten hexagon head bolts hand tight for fastening the bonnet (165) to the valve body (100). Make sure there is no visible gap between body (100), diaphragm (443) and bonnet (165).
  Now take the valve to the closed position as described above (in the case of manually actuated valves by turning the handwheel clockwise; then back off by one full anti-clockwise rotation).
  After that, evenly tighten the hexagon head bolts (901) crosswise at the required torque. The required torques are given in section 10.

  It is important to make sure that the arrow on the protruding labelling flap of the diaphragm (443) is pointing in the valve seat flow direction. Only then is the valve's shut-off function ensured. The diaphragm must never be arranged such that the arrow is perpendicular to the flow direction, i.e. parallel to the weir in the body (100).

- Make sure to evenly tighten the hexagon head bolts (901) crosswise when fastening the bonnet (bonnet) on the body (100).

Replacing the diaphragm of SISTO®-LC and SISTO®-B

On diaphragm valves, the diaphragm is the highest stressed component.
The diaphragm is not only subject to mechanical stress but also to wear caused by the medium. We recommend to regularly check the diaphragm at intervals to be individually stipulated depending on service conditions and actuation frequency. For checking the diaphragm, remove the bonnet from the body.

- Take valve to the open position.

- Undo hexagon head bolts (901) to dismantle bonnet (165).

- Take valve to the closed position. To do so, turn handwheel (961) clockwise on manually actuated valves; supply compressed air to the upper control air supply port on actuators with air to open/air to close function and spring to open function; release the air from the actuator in case of actuators with spring to close function.

- Turn counter-clockwise to dismantle diaphragm (443) with fastening thread. Diaphragms featuring a fastening button on the back of the diaphragm are buttoned into the compressor (553) by means of this button. Simultaneous pulling and turning on one side will easily remove the diaphragm (443) from the compressor.

- Effect mounting of a new diaphragm (443) in reverse order. Prior to installation, remove protection from fastening grub screw of the diaphragm, if applicable. Always screw in the diaphragm as far as it will go, i.e. until it rests against the compressor (553); back it off by a maximum of 90°. Prior to mounting the bonnet (165) on the valve body (100), take the valve to the open position.

- Place bonnet (165) with diaphragm on the body (100) and tighten hexagon head bolts hand tight for fastening the bonnet (165) to the valve body (100). Make sure there is no visible gap between body (100), diaphragm (443) and bonnet (165).
  Now take the valve to the closed position as described above (in the case of manually actuated valves by turning the handwheel clockwise; then back off by one full anti-clockwise rotation).
  After that, evenly tighten the hexagon head bolts (901) crosswise at the required torque. The required torques are given in section 10.

8.4 Replacing the valve disc

Undo hexagon head bolts (901) to dismantle the cover. The valve disc (746) is now lying loosely in the body, ready to be replaced. Effect installation of the replacement valve disc in reverse order, making sure to centre the valve disc (746) in the cover (160). Evenly tighten the hexagon head bolts (901).

8.5 Replacing the ball

Undo hexagon head bolts (901) to dismantle the upper body (101) from the lower body (102). The ball (489) is now lying loosely in the lower body (102) ready to be replaced. Evenly tighten hexagon head bolts (901) crosswise when reassembling the upper body (101).

8.6 Valve reassembly

Valve reassembly shall be effected in reverse order to dismantling.

To maintain functional reliability, new gaskets shall be used whenever the valve is reassembled.

After reassembly and prior to commissioning / start-up, the valves shall be subjected to a leak test in accordance with DIN 3230, Part 3.

9. Trouble-shooting

9.1 General

SISTO valves and pneumatic actuators are robust in design. Nevertheless, malfunctions e.g. caused by maloperation, lack of maintenance or improper use cannot be ruled out completely. All repair and maintenance work shall be performed by skilled, properly personnel using suitable tools and original spare parts. We recommend to have this work performed by our service personnel.
The safety instructions in sections 3 and 8 must be complied with.

9.2 Faults > Remedies

- **Leakage at the mating flanges**

Possible causes:
- contaminations/solids in the fluid
- erosion, corrosion, abrasion
- excessive loads from pipeline forces or thermal stresses

> Dismantle, clean and replace seal elements.

- Leakage at the cover / bonnet bolting

Possible causes:
- seal element has settled as a result of high temperature fluctuations
- impermissible pressure loads
- poor maintenance
- poor seal element resistance to temperature and fluid handled

- Bolted bonnet/cover

> Re-tighten the bonnet/cover bolting (901).
> Replace the seal element (411) (diaphragm / joint ring) after having removed the bonnet/cover bolting (902.1/920.1). Clean the sealing surfaces carefully before inserting a new joint ring.

If you have any questions please contact the manufacturer.

10. Tightening torques (Nm) of bonnet / cover bolting

SISTO®-KB

Lining Coating	Diaphragm	Nominal diameter (DN)											
		015	020	025	032	040	050	065	080	100	125	150	200
Without coating Hard lining Coated	EPDM, NBR, CSM, IIR	6	6	12	12	12	30	35	45	45	50	60	70
Soft lining	EPDM, NBR, CSM, IIR	5	5	10	10	10	25	30	40	35	40	45	50

SISTO®-10

Lining Coating	Diaphragm	Nominal diameter (DN)											
		015	020	025	032	040	050	065	080	100	125	150	200
Without coating Hard lining Coated	EPDM, NBR, CSM, IIR	6	6	8	15	15	25	35	50	35	45	65	75
Without coating Hard lining	PTFE	8	8	10	18	18	30	40	55	40	50	70	85
Soft lining	EPDM, NBR, CSM, IIR	6	6	8	13	13	22	35	45	35	40	50	60
Soft lining	PTFE	6	6	8	15	15	25	35	50	35	40	55	65

KRV

Lining	Nominal diameter (DN)										
	020	025	032	040	050	065	080	100	125	150	200
Hard lining Soft lining		20		40	40	40	60	80			

SISTO®-16/20 / SISTO®-16 RGA / SISTO®-16 HWA/DLU/TWA

Lining Coating	Diaphragm	Nominal diameter (DN)											
		015	020	025	032	040	050	065	080	100	125	150	200
Without coating Coated	EPDM, NBR, CSM, IIR	10	4	4	10	10	15	20	20	40	40	50	50
Without coating Coated	PTFE	20	15	15	25	25	40	55	55	80	80	100	100
Hard lining	EPDM, NBR, CSM, IIR	10	6	6	12	12	18	24	24	48	48	60	60
Hard lining	PTFE	18	13	13	22	22	36	50	50	70	70	90	90
Soft lining	EPDM, NBR, CSM, IIR	8	5	5	10	10	15	20	20	40	40	50	50
Soft lining	PTFE	10	6	6	12	12	18	24	24	48	48	60	60

SISTO®-16S

Lining Coating	Diaphragm	Nominal diameter (DN)											
		015	020	025	032	040	050	065	080	100	125	150	200
Without coating Coated	EPDM, NBR, CSM, IIR	10	10	10	10	10	15	15	20	40	40	50	50
Without coating Coated	PTFE	20	20	20	20	25	40	40	55	80	80	10	100
Hard lining	EPDM, NBR, CSM, IIR	10	10	10	10	12	18	18	24	48	48	60	60
Hard lining	PTFE	18	18	18	18	22	36	36	50	70	70	90	90
Soft lining	EPDM, NBR, CSM, IIR	10	10	10	10	10	15	15	20	40	40	50	50
Soft lining	PTFE	10	10	10	10	12	18	18	24	48	48	60	60

SISTO®-C

Diaphragm	Diaphragm diameter (MD)							
	30	40	65	92	115	168	202	280
EPDM	1,5	3	8	12	14	18	32	40
TFM/EPDM	1,5	3,5	8	12	18			
PTFE/EPDM	2	4	10	18	30	40	60	75

SISTO®-LC / SISTO®-B

Diaphragm	Nominal diameter (DN)					
	015	020	025	032	040	050
EPDM	2,5	3	4	6	10	15

RSK/RSK-S

Lining Coating	Nominal diameter (DN)									
	015	020	025	032	040	050	080	100	125	150
Without coating	8	8	8		10	10	15	15	20	20
Soft lining	8	8	8		10	10	10	10	15	15
Hard lining	8	8	8		15	15	20	20	30	30

sales document, no technical document,
alterations are subjet to technical development

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